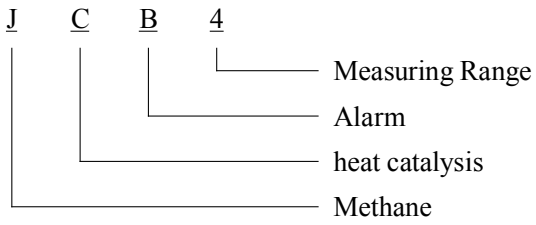
Operation Manual of JCB4 Methane Detection Alarm （20090523）

A. Summarization

1. Characteristics and application

JCB4 Methane Detection Alarm (short for methane alarm) adopts micro-processing technology characterizing in small, light, easy operation and convenient maintenance. All calibration parameters and linearity correction are finished by software. It is applicable to detect the concentration of the methane in the working environment where inflammable and explosive mixed gases exist.

2. Type marking

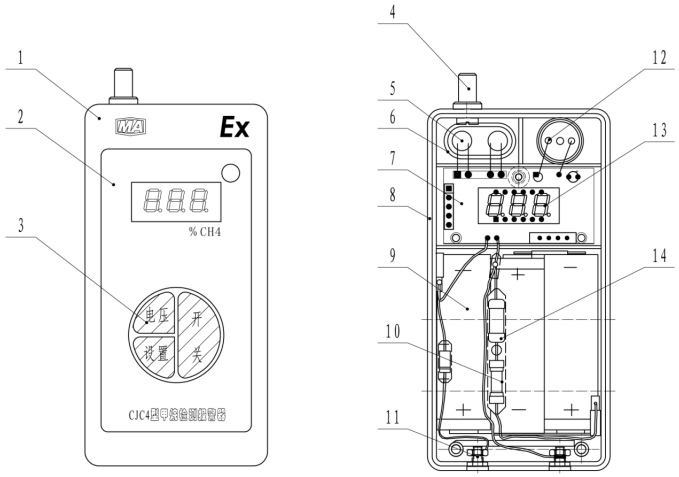


3. Standard

AQ 6207-2007《Portable Carrier catalysis Methane Detection Alarm》、Q/SD 021-2008《JCB4 Methane Detection Alarm》

B Working principle and Structure

1 The structure of JCB4Methane Alarm is as below figure 1.



1.Upper cover 2.PVC mask 3. Power switch key 4. Mouth of gases mark 5. **T**hermocatalysis component 6. Component protection cover 7**.** Circuit board 8. Lower casing 9. Battery pile 10. Current-limiting resistor 11. Charging bolt 12. Buzzer 13. Nixietube display screen 14. Fast fuse

Figure 1

2 Working principle

Block graph of working principle for methane alarm see figure 2. While methane alarm is in methane gas environment, the methane gas enters into component protection cover through the transom window of lower casing. The flameless combustion occurs on the surface of the component inside the protection cover (carrier catalytic components), therefore its resistance value increases. The Wheatstone bridge composed of carrier catalytic components and resistor loses balance and outputs voltage signal. The voltage signal is positive proportional to methane concentration. Magnified by linear magnifier, the signal is input into the A/D converter inside the singlechip, and then processed by the micro-processor and shown as methane concentration by digital tube. The methane alarm emits voice & light alarm while methane concentration value exceeds set alarm point.

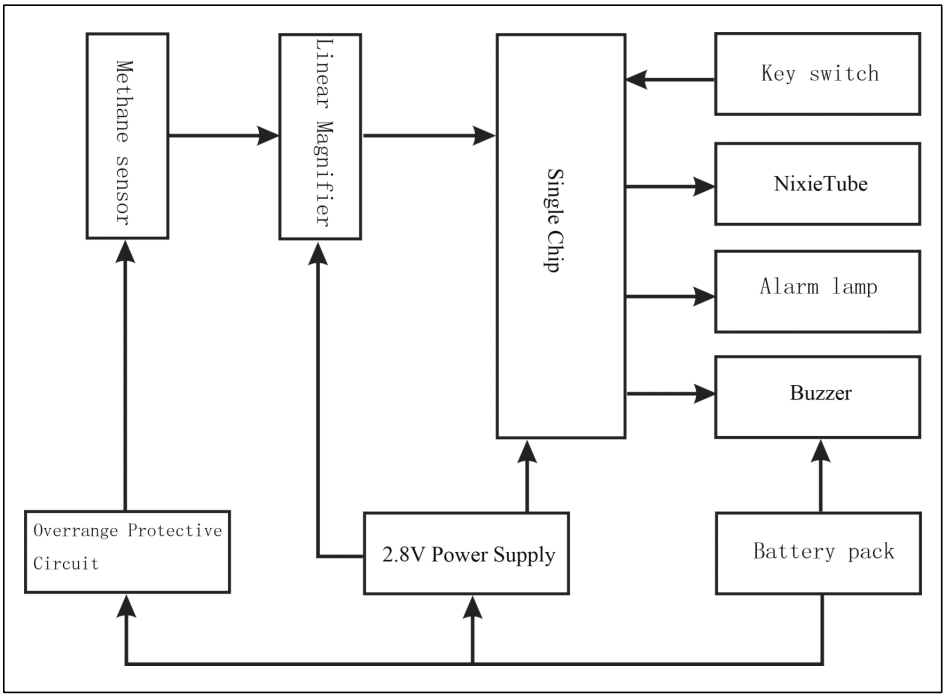


Figure 2

C Main specifications (See Table 1)

Table 1

Item	Specification			
Measuring range	（0.00～4.00）%CH_4			
Tolerance	Detecting range	0～1.00	1.00～3.00	3.00～4.00
	Allowed tolerance	±0.10	True value ±10%	±0.30
Alarm point	Set at will in（0.50～2.5）% CH_4 （Original set 1.00%CH_4）			
Response time	≤20s			
Resolution	0.01%CH_4			
Carrier catalytic element	Working voltage of Carrier catalytic element is 2.8V， Working current ≤100mA			

Display mode	3-digital LED
Battery pack	AA type 1800mAH 、 3.6V Ni-Mh Battery pack （ inside connect 1.5Ω/16W current-limiting resistance in series）
over range methane impact protection	When concentration of methane is ≥4.50%，nixietube twinkling、the methane alarm shuts off automatically after the buzzer alarm once.
Low voltage alarm	When the battery voltage lower than 3.3V, alarm lamp twinkling， When the battery voltage lower than 3.1V， the methane alarm shuts off automatically after the buzzer alarm once.
Explosion protection	Intrinsically safe and flameproof for mining,explosionproof mark Exibd Ⅰ
Dimensions	101×51×23mm
Weight	<0.2kg
Working conditions	1、Working temperature：（0～40）℃；2、Relative humidity：≤98%（at 25℃）； 3、Air pressure：（68～116）KPa；4、Wind speed：（0～8 ）m/s； 5、Underground coal mine with explosive gases.

D. How to use

1 Function key-press

Key-press distribution as Figure 1 and its function is as below:

1）“On/off” key: Press it for a while when the detector is under shutdown mode, then the detector open up. Press it for a while when the detector is under open up mode but not setting mode, then the detector close down. When the detector is under setting mode, this key is used as data degression key.

2）“Voltage” key: To press this key to show battery voltage when the detector is under openup mode; and it is used as increase key when the detector is setting ,adjusting.

3）“Setting” key: Press “voltage” and “setting” for 3 seconds when the detector is under open mode, then the detector turns into setting mode. It is used as confirming key when the detector is setting and adjusting.

2 System setting and adjustment: (See appendix: Operation diagram of system Menu)

Before setting or adjustment, the detector should be open up for 10 minutes preheat or under stable state.

1）Zero adjustment: Press “voltage” and “setting” key for 3 seconds at the same time, the detector enters into setting state and the digital tube shows “1”. Then confirm the setting, adjustment finishes when hearing a sound.

Note: The process of zero adjustment should be taken in clean air. It is prohibited to adjust zero when the air cleanliness does not meet requirements and the digital tube will show “ERR”.

2）Calibration: Under setting state, to adjust by using “Voltage” or “On/off” key till the digital tube shows “2”, then confirm by pressing “setting” key, and the detector enters into calibration state when hearing a sound. And here the value shown in digital tube is the one set last time. To adjust a value of this time by using “Voltage” or “On/off” key, confirm by pressing the “setting” key to back setting state.

Note:

1. The calibration should be taken after standard gas enters into stability. The flux of standard gas sample should be 200ml/min.
2. It must be, for the adjusted value, the same as of standard gas sample, otherwise the measuring accuracy would be influenced.
3. It is prohibited to take calibration before input standard gas sample. If wrong operation is taken, please recover it as per clause 4 “recovery setting:”.

3）Setting alarm point: Under setting state, to adjust by using “Voltage” or “On/Off” key till the digital tube shows “3”, then confirm it by pressing “Setting” key and the detector enters into alarming point setting mode after hearing a sound. Here the value shown in digital tube is the one adjusted last time. To adjust the value to the needed setting by using “Voltage” or “On/Off” key, then confirm it by pressing “setting” key and exit the alarm point setting mode to the setting mode..

4) Recovery original setting: Under setting state, to adjust by using “Voltage” or “On/Off” key till the digital tube shows “4”, then confirm by pressing “setting” key, and all the parameter of the detector recover as it is leaving factory after hearing a sound.

5）Exit setting state: After all parameter adjustment finishes and back to setting mode, to press “Voltage” or “On/Off” key till the digital tube shows “0”, then press “setting” to confirm it. It exits the setting state when hearing a sound and here the digital tube shows concentration value of present methane.

6）Under setting state, the detector will automatically enters into methane measuring state if no any operation is taken over 5 minutes. The digital tube shows concentration value of present methane.

3 Methane measurement

When it is opened up, the detector enters into methane measuring state automatically and digital tube shows concentration value of methane.

4 Battery voltage measurement

Under opening state, to press the “Voltage” key for a while, the digital tube shows battery’s voltage. To loose it, 0.5 seconds later the detector will enters into methane measuring state automatically.

5 Charging.

There is specific and intelligent charger to charge up the detector and the charging process is automatic. To plug the charger into AC 220V when it need to be charged, the indicating light turns into orange, showing the power supply is connected. Then put the detector block into the charger slot, the indicating light turns into red, showing the charging process begins. It is charged full when the indicating light turns into green.

E. Ordinary faults analysis and debugging (See table 2)

Table 2

Faults phenomena	Cause analysis	Solutions
Unable to open	Over low voltage or ineffective for the battery.	To charge or replace the battery.
	Poor contact for the battery.	To re-weld it after finding out the reason.
Unable to adjust zero	There is combustible gas in the air.	Put the detector into clean air.
	Failure on key-press.	Replace a thin film switch
There is sound but no light while alarming.	LED damaged	Replace the LED
There is light but no sound while alarming.	Buzzer damaged	Replace the buzzer
Time of continuous work is less than 9 hours.	Insufficient battery. capacity	Recharge the battery.
	Aged battery.	Replace the battery.
Decline of resolution	Aged carrier catalytic element or poisoned	Replace the carrier catalytic element.

F. Important hints

1.Please read this user manual seriously before using, and operate it correctly.
2.There should be specific personnel to maintain the equipment and use it strictly according to user manual. It is prohibited to disassemble it at will.
3.During period of using and carrying it in the leather coat, please keep it clean and protect it from severe hit..
4.It is prohibited of existence of such chemical substance as organosilicon and binder. Because such substance will cause poisoning of the catalytic element.
5.The carrier catalytic element and battery components are explosion proof parts. So it is prohibited to change their specification and parameter while repairing and replacing. It should be maintaining and replacing by specific personnel and use spare parts supplied by the manufacturer.
6. The adjustment should be carried periodically, usually once a week.
7.It is strictly prohibited to disassembly it underground mines.
8.The intelligent charger for the methane detector is a product without explosion proof feature, so it is prohibited to be used underground mines.
9. It is strictly prohibited to change the intrinsic safety circuit and the model, specification of the elements which concern with the intrinsic safety circuit. It is strictly prohibited to use battery which not include in the operation manual.
10.It proves that the catalytic element end its life when can not adjust the value as same as type sample methane because of long term usage. It should be re-adjust after replacing the element.

G. Whole set

1 Methane detection alarm	1pc
2 Leather coat	1pc
3 Charger	1pc
4 Operation Manual	1pc

H. Transportation and storage

1. It can be transported by all kinds of means which including land-carriage, water carriage and air parcel. It should avoid impacting, heavy pressing, raining and avoid mixing with corrosive.
2. It should be stored in well ventilation, no corrosive gas, no dropping and liquid attack warehouse of which relative humidity is no more than 90%, temperature is between 0℃~40℃.

I. Unpack and check

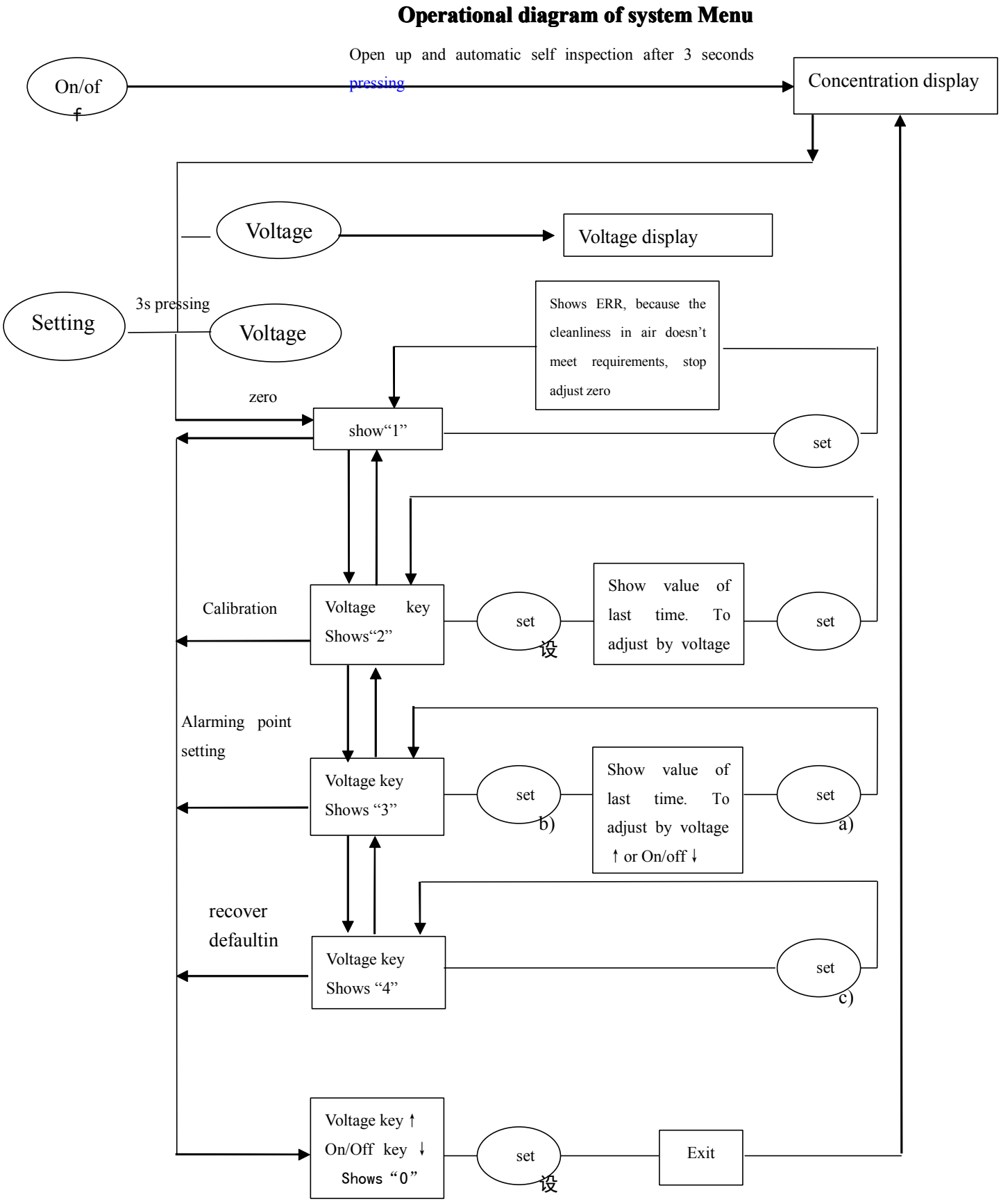
Open the package to check the whole set according to Clause 7 required in this manual.

J. Warranty

We guarantee the quality of the detector within 12 months (except for the carrier catalytic element) from the date when it is sold and would be responsible to repair it free in charge for any non-man-made damage during the period (except for any damage from force majeure, e.g. natural disasters, war, etc).

Manufacturer reserves the rights to change content of manual operation.

Appendix：


Operational diagram of system Menu
Open up and automatic self inspection after 3 seconds pressing
On/off
Concentration display
Voltage
Voltage display
Setting
3s pressing
Voltage
Shows ERR, because the cleanliness in air doesn't meet requirements, stop adjust zero
zero
show"1"
set
Calibration
Voltage key Shows"2"
set
设
Show value of last time. To adjust by voltage
set
Alarming point setting
Voltage key Shows "3"
set
b)
Show value of last time. To adjust by voltage ↑ or On/off ↓
set
a)
recover defaultin
Voltage key Shows "4"
set
c)
Voltage key ↑ On/Off key ↓ Shows "0"
set
设
Exit